



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/792,069

03/03/2004

Wei-Yung Hsu

AMAT/5614.D1/CMP/CMP/RKK

4228

44257 7590 04/03/2007  
PATTERSON & SHERIDAN, LLP  
3040 POST OAK BOULEVARD, SUITE 1500  
HOUSTON, TX 77056

EXAMINER

LEADER, WILLIAM T

ART UNIT

PAPER NUMBER

1742

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
--	-----------	---------------

3 MONTHS

04/03/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

5

## Office Action Summary

Application No.

10/792,069

Applicant(s)

HSU ET AL.

Examiner

William T. Leader

Art Unit

1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 March 2004 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. ____.                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>See Continuation Sheet</u> .                                  | 6) <input type="checkbox"/> Other: ____.                          |

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :6/2004, 8/2004, 2/2005, 12/2006.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 1, 2, 4, 5, 8-14 and 16-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Uzoh et al (6,354,916).

2. The Uzoh patent is directed to a process for electroplating and planarization. As disclosed in example 3 which repeated example 2 using a copper electroplating solution containing an oxidizer. The substrate, which was a semiconductor wafer, was positioned in the electrolyte at a first distance from a permeable disc. The permeable disc was a polishing pad supplied by 3M. The plating solution was directed toward the wafer through openings in the anode assembly and the pad as shown in figure 2. This shows that the pad was permeable as recited in instant claims 1 and 13. A plating current was applied to cause copper to be electroplated onto the wafer. Thus, all steps recited in instant claim 13 are disclosed by Uzoh et al.

3. Instant claim 1 additionally recited the step of positioning the substrate a second distance from the permeable disc, the second distance being less than the first distance. In the examples of Uzoh et al, the substrate was initially positioned at a distance of around 0.1 cm (10 mm) from the pad. After an initial period of 30 seconds, the pad was pushed against the wafer. Thus, all steps recited in instant claim 1 are disclosed by Uzoh et al.

4. With respect to claims 2 and 14, as noted above, the electroplating of Uzoh et al contains copper. With respect to claims 4, 12, 16 and 19, the plating current applied by Uzoh et al was 2 amps (column 8, lines 17-8) which falls within the ranges recited by applicant. With respect to claims 5 and 17, the permeable disc of Uzoh et al is a polishing pad, as discussed above. With respect to claims 8 and 9, as noted above, Uzoh et al discloses that the pad is pushed against the wafer so that that the substrate and disk are in contact. With respect to claims 10 and 18, Uzoh et al discloses that it is known to transfer the plated wafer to a separate CMP (chemical mechanical polishing) apparatus (column 7, lines 1-2). With respect to claim 11, Uzoh et al discloses that the pressure applied is 1 psi (example 2).

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 3, 7 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uzoh et al (6,354,916).

8. Claim 7 differs from the process of Uzoh et al by reciting that the initial distance is between about 1 and 5 mm. In example 1 of Uzoh the electroplating was conducted with a distance between the pad and the wafer of 0.1 cm (10 mm). However, Uzoh et al discloses that the distance between the wafer surface and the pad is adjustable (column 6, lines 51-53). The use of an intermediate distance to which the apparatus of Uzoh can be adjusted is a result-effective variable and would have been a matter of routine optimization based on other process parameters such as plating solution flow through the pad and relative pad-wafer motion. Claims 3 and 15 recite that the less than 5000 angstroms were plated at the first distance. Uzoh et al is silent as to the amount of material deposited, although example 2 discloses that the plating period at the first distance was 30 seconds. Choice of an amount at the first distance is a result-effective variable and would have been a matter of routine optimization based on the teaching of Uzoh et al. Uzoh et al discuss the effects of plating at different distances and pressures and illustrate a range of effects in figure 1. Choice from within the range illustrated in figure 1 would have been obvious because the desired results would have been obtained.

9. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Uzoh et al (6,354,916) in view of Taylor et al (6,210,555).

Art Unit: 1742

10. The Taylor et al patent is directed to the electrodeposition of metal into small recesses such as those on a semiconductor wafer. Taylor et al disclose that the use of pulse current, as described in the abstract and shown in figure 1, alleviates problems encountered when plating into small blind holes and vias by avoiding excessive deposition on convex portions of the substrate (column 2, lines 51-58.

11. The prior art is indicative of the level of skill of one of ordinary skill in the art. It would have been obvious at the time the invention was made to have utilized pulse plating as disclosed by Taylor et al in the process of Uzoh et al because problems such as excessive deposition of edges would have been avoided.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William T. Leader whose telephone number is 571-272-1245. The examiner can normally be reached on Mondays-Thursdays and alternate Fridays, 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1742

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

WL

William Leader  
March 29, 2007

ROY KING  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700